

Significance Determination Process Evaluation

Scope and Objectives—The staff of the U.S. Nuclear Regulatory Commission (NRC) evaluated the significance determination process (SDP) in accordance with Inspection Manual Chapter (IMC) 0307, “Reactor Oversight Process Self-Assessment Program.” The staff used self-assessment metrics and other pertinent information to provide insights regarding the effectiveness of the Reactor Oversight Process (ROP) in fulfilling the regulatory principles of being objective, risk-informed, understandable, and predictable, as well as ensuring safety, openness, and effectiveness. The staff also obtained input from internal stakeholders through biweekly conference calls, counterpart meetings, focus groups, and the internal feedback process. In addition, the staff obtained external feedback through a *Federal Register* solicitation for comments and through periodic meetings with the industry and other stakeholders.

Based on the metric results, stakeholder feedback, and other lessons learned through ongoing program monitoring, the staff identified certain issues and actions to improve the SDP. This enclosure discusses the implementation issues, and Enclosure 5 summarizes their status. In addition, the annual ROP performance metric report, available through the Agencywide Documents Access and Management System (ADAMS), provides the data and staff analysis for each of the program area metrics (reference ADAMS Accession No. ML060590135).

Summary of Previous Self-Assessment—The most significant changes to the SDP since initial implementation took place in 2004, as described in SECY-05-0070, “Reactor Oversight Process Self-Assessment for Calendar Year 2004,” issued April 25, 2005. During that period, the staff issued two new and two significantly revised SDPs. The staff used the SDP Improvement Plan to address key stakeholder recommendations, including those from the SDP task group, an audit by the Office of the Inspector General (OIG), and internal and external feedback. The timeliness of final significance determinations had improved in fiscal year (FY) 2004 in all areas but fire protection, causing the NRC not to meet the established goal. The staff anticipated continued challenges in FY 2005 with SDP timeliness, particularly with fire protection issues, and committed to provide the Commission with an evaluation of the effectiveness of changes made to improve the timeliness of the fire protection SDP (FPSDP). Additionally, several stakeholders continued to express concern that the SDP results do not translate to the same level of significance across all cornerstones.

Ongoing SDP Improvements—In calendar year (CY) 2005, the staff continued to implement initiatives to improve the SDP process and timeliness in issuing final SDP results. In particular, the staff continued to implement the SDP Improvement Plan. The Office of Nuclear Reactor Regulation (NRR) Director’s Quarterly Status Update tracks the status of actions.

The staff evaluated recommendations on improving SDP timeliness submitted by the Nuclear Energy Institute (reference ADAMS Accession No. ML051220253). After careful consideration, the staff determined that the recommendations were either already being addressed, were not feasible, or warranted further discussion during the monthly ROP meetings. The staff’s detailed response to the recommendations can be found under ADAMS Accession No. ML051330334.

In 2005, the staff made significant advances to complete the objectives of the SDP Improvement Plan. In particular, the staff issued a new SDP procedure (Appendix K to IMC 0609, "Significance Determination Process") addressing maintenance rule inspection findings in May and completed Revision 2 of the risk-informed inspection notebooks and accompanying pre-solved SDP Phase 2 tables in December.

Three of the plan's objectives were placed under the Risk Assessment Standardization Project (RASP) effort for resolution: (1) develop criteria for early recognition of the need for in-depth risk evaluation, (2) develop criteria for assessing licensee probabilistic risk assessment (PRA) quality, and (3) develop a low-power/shutdown operations model. The staff will continue to track these initiatives in the SDP Improvement Plan.

SDP Timeliness—The timeliness of final significance determinations is one of the critical measures of SDP effectiveness. According to its existing timeliness goal, the NRC will complete the final significance determinations that are of greater-than-green significance within 90 days after the issuance of the first written correspondence to the licensee describing the finding. The percentage of completed findings remained below the associated timeliness metric—the goal for FY 2005 was 85 percent within 90 days. In part, this resulted from the impact of closing several longstanding issues, as detailed in the performance metric discussion. The final metric performance for FY 2005 was 68 percent, although many of the untimely issues missed the 90-day goal by just a few days.

The staff continued to evaluate a new metric for SDP timeliness and proposed a replacement metric of average time combined with a "backstop" approach of no more than a certain time, such as 180 days, to complete all SDP evaluations. The staff revised IMC 0307 accordingly to test the proposed average time and backstop metric in 2006 along with the existing timeliness metric. As noted in IMC 0307 and the NRR operating plan, the metric for FY 2006 remains the completion of 90 percent of all inspection findings that are determined to be of greater-than-green significance within 90 days.

In 2005, the staff completed other SDP program initiatives to improve timeliness. The staff introduced the Planning Significance and Enforcement Review Panel (SERP) aimed at engaging decisionmakers early in the SDP evaluation to more effectively address the scope of the evaluation, the resources needed, and the schedule to complete the evaluation to ensure that potential timeliness issues are minimized. The Planning SERP will allow the regions to identify the following early in the evaluation process:

- findings of such technical complexity that existing SDP evaluation tools are not readily adaptable to the issue, and/or that the region does not have the expertise or resources to consider in terms of risk
- findings that have potentially high safety significance (i.e., yellow or red) that may require more comprehensive examination for potential impact on plant safety and subsequent NRC action

The staff incorporated the Planning SERP process into IMC 0609 in November 2005.

The staff made other enhancements to the program to encourage the use of the best available information when assessing the significance of inspection findings. Specific changes included

guidance on using a simplified versus detailed SDP Phase 3 evaluation, when possible; guidance discouraging the staff from creating new risk tools or performing extensive evaluations during the SDP process, resulting in significant delays; deleting the option for licensees to provide new information once a final SDP decision is made; and specifying to licensees the amount of time they have to complete their review of the preliminary SDP decisions and schedule the subsequent regulatory conference.

As a result of these changes, the staff anticipates improvement in SDP timeliness but recognizes continued challenges. The staff completed three timeliness-enhancing objectives outlined in the SDP Improvement Plan. However, these objectives will remain open for 2006 while the staff continues to assess their impact on the timely completion of the SDP. In 2006, the staff is also addressing the objective to develop a management decisionmaking process that will help finalize issues in areas not covered by SDPs or when significant uncertainty exists, rendering conventional SDP assessment tools less effective towards reaching a final decision.

Fire Protection SDP (FPSDP)—The staff significantly revised the FPSDP in 2004 and expected improvements in the timeliness of finalizing fire protection issues. In 2005, the staff conducted an interim evaluation and determined that timely completion of FPSDP determinations continued to lag behind other areas. Currently, the staff does not have enough experience implementing the revised guidance to determine whether enhancing the FPSDP will significantly contribute to improving the timeliness of fire protection issues.

The staff believes that the FPSDP is a logical and probabilistic process, given the inherent complexities associated with fire-related issues. The evaluation process continues to encounter delays generally associated with initial understanding and implementation and, to some extent, inspection practices. However, the staff believes that the revised FPSDP is a much improved risk-informed approach.

Several initiatives are underway to improve FPSDP implementation, including the following:

- The staff is modifying the FPSDP training course, which will be ready to train inspectors and senior reactor analysts (SRAs) in 2006. The course will incorporate lessons learned and provide the vehicle needed to maintain inspector and SRA expertise in implementing the FPSDP.
- Headquarters staff will continue to directly support the regions as needed to accelerate the closure of old and emerging issues.
- Headquarters staff, with regional input, will enhance the inspection data collection process to assure that most information required to enter the FPSDP is available to the inspectors and SRAs at the conclusion of the inspection.
- The staff has developed an improved Phase 1 screening tool for electrical circuit-related findings and is reviewing it for incorporation into the evaluation process.

The staff believes that the revised FPSDP will result in a significant improvement in SDP timeliness, particularly once the appropriate training and inspection guidance are in place.

Towards the end of 2005, licensees notified the staff that more than 30 plants will adopt National Fire Protection Association (NFPA) Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," as it is endorsed by Title 10, Section 50.48c, of the *Code of Federal Regulations* (10 CFR 50.48c). Plants that have committed to NFPA 805 are covered by an enforcement and assessment discretion during the transition period. In the long term, NFPA 805 has the potential to help focus licensee and NRC attention on those issues of greatest safety significance.

Phase 2 SDP Notebooks—The Phase 2 SDP notebooks provide the guidance on risk-informing reactor inspection findings for at-power situations. Initial versions of the documents failed to adequately capture the individual plant characteristics, and the process was not coordinated with licensee PRAs. This often resulted in under or over estimation of the change in risk associated with inspection findings. Subsequently, the staff revised all 71 notebooks. The NRC issued the notebooks as Revision 1 in 2003 and posted them to the NRR internal Web page for staff use. In retrospect, it became important to further standardize all benchmarked notebooks to match the quality of the last notebooks benchmarked. The staff completed this standardization effort and issued the amended notebooks as Revision 2 in 2005.

Each Revision 2 notebook now includes SDP Phase 2 pre-solved tables. These tables identify the value of each sequence when a particular component or human action is degraded for a certain exposure time. Each spreadsheet contains approximately 40 to 50 plant-specific key components and/or operator actions. The spreadsheet and corresponding pre-solved tables represent the solution and answer key to these items. In addition, the staff incorporated large early release frequency (LERF) risk aspects in both the notebooks and the associated spreadsheets. In December 2005, the NRC posted the Revision 2 SDP inspection notebooks and the new pre-solved spreadsheets on the NRR internal Web page. Since training on the use of the spreadsheets has not yet been provided, users are directed to an instruction file prior to applying the process and are advised to use the spreadsheets only as a verification of the outcome of the existing SDP products. The staff will complete additional guidance on use of the pre-solved spreadsheets and associated training in 2006. Creation of the pre-solved tables was a key outcome of the 2002 SDP task group review.

Standardized Plant Analysis Risk (SPAR) Models—The Office of Nuclear Regulatory Research has completed development of all Revision 3 SPAR models for internal events. Currently, efforts are in progress to further enhance Revision 3 SPAR models for internal events as part of RASP. These efforts involve (1) benchmarking each SPAR model against the licensee's PRA by comparing cut sets generated by each model and (2) incorporating into the Revision 3 SPAR models the resolution of the plant-specific PRA modeling issues that were identified in the onsite reviews of the Revision 3 SPAR models during notebook benchmarking visits, the Mitigating Systems Performance Index program reviews, and feedback from model users. The staff will incorporate accepted differences with the licensee's PRA into the SPAR model to provide a more enhanced Phase 3 SDP analysis tool for at-power internal events.

Development of SPAR models for issues related to low-power/shutdown conditions, calculation of LERF, and external events is also in progress and included in RASP. Currently, the staff has developed 11 low-power/shutdown models, 4 LERF (or Level 2) models, and 6 external events models for trial use. An effort is planned to integrate these models with the enhanced Revision 3 SPAR Level 1 models.

External Event Contribution—The SDP requires consideration of the contribution of external events (fire, high winds, external flooding, etc.) to overall risk for findings that may represent a risk of greater than 1E-7 per year. The staff currently develops the method for performing this portion of the analysis on a case-by-case basis, which poses an additional challenge to meeting SDP timeliness. A task group is considering development of a methodology used to account for the added risk contribution from external events. Based on a pilot program, the task group is evaluating two potentially viable methodologies. An assessment tool incorporating one of the methodologies for use by inspectors and SRAs is several years from completion. A dedicated group is developing a simple screening tool that would help inspectors verify that the risk contribution from external initiators is minimal as part of the reactor safety Phase 1 process. The staff plans to develop a schedule for completion in 2006.

SDP Performance Metrics—The staff maintains eight metrics to monitor the quality of the SDP. Two of the eight SDP metrics failed to meet program expectations, namely (1) timeliness of final significance determinations and (2) appropriateness and consistency in the regulatory response yielded by the SDP across all ROP cornerstones. The CY 2005 metric report did not include one of the eight SDP metrics, based on a survey of internal stakeholders, because the staff did not conduct an internal survey in CY 2005, consistent with its biennial frequency as defined by IMC 0307.

The percentage of final significance determinations completed within 90 days of transmitting the inspection report increased from 48 percent in FY 2004 to 68 percent in FY 2005, but still did not meet the metric of 85 percent set for FY 2005. However, five of the seven late issues missed the limit by 6 or fewer days, and had they been completed on time, then 91 percent of the final significance determinations would have been timely and the metric would have been met.

The continued negative perception by the majority of external survey respondents that the SDP results do not translate to the same level of significance across all cornerstones resulted in a second failed metric. In particular, the emergency preparedness and public radiation safety SDPs were thought to be deterministic and not appropriately characterized by risk insights. Stakeholders have expressed concern about this issue since the early inception of the ROP. The staff continues to believe that relative parity has been achieved among the cornerstones, based on the potential impact on public health and safety and the designated NRC response to specific findings.

Stakeholder Survey Results—The staff did not conduct an internal survey in CY 2005; therefore, the input to this discussion came solely from the external survey conducted in October 2005. Participants in the external ROP survey included nine industry representatives, four State or local government agencies, seven private citizens or public interest groups, and one anonymous stakeholder. The respondents had the opportunity to answer 18 specific questions and provide general comments on the ROP. Only the sixth question, “Does the Significance Determination Process yield an appropriate and consistent regulatory response across all ROP cornerstones,” directly asked respondents to address the SDP, while responses to most other questions also had some SDP aspect. Most responses to the sixth question skewed towards the negative but for varying reasons. Two believed that the NRC’s handling of the Davis-Besse risk evaluation clearly illustrates the lack of equivalency between the cornerstones. Three responses pointed to the inconsistent outcome between the risk-informed and the more deterministic SDP formats. One respondent stated that a lack consistency exists

but was not sure how to assess the question of equivalency between the cornerstones when considering findings for risk. Similar to the previous assessment period, the responses generally held that the SDP did not yield equivalent results for issues of similar significance in all ROP cornerstones.

Responses to 10 of the remaining 17 survey questions included some additional comments related to the SDP. Most were negative and targeted the following areas: (1) final SDP determinations for issues with greater-than-green significance are not timely and require significant resources, (2) some SDPs are too complex to be understood by the public, and the security SDP is not an open process, (3) the process allows licensees to challenge most significant findings to reduce significance, (4) some SDPs are not sufficiently rigorous or robust to provide accurate/consistent results, (5) the 90-day SDP completion goal is too limiting for licensees to provide good information regarding the findings, and (6) the NRC should require standardized licensee PRAs to reduce uncertainty. Enclosure 6 provides more detail on the results of the external survey.

External stakeholders provided a number of negative comments about the SDP in CY 2005, both in writing and verbally in meetings. Industry representatives generally agree that the SDP is a large improvement over the pre-ROP procedure for assigning risk significance to issues. However, they believe that the process takes too long and requires too much effort, except for those licensees responding to potentially greater-than-green findings. Licensees in the latter category are generally not concerned with timeliness and are willing to expend significant resources to respond to the issue. The staff notes that it does not require a licensee to provide information, but rather offers the opportunity to create an open dialogue and gather the best available information. Other external stakeholders criticize the SDP in part because the probabilistic information used in some significance determinations is not available to the public and because understanding the process requires significant knowledge of reactor safety and PRA, thereby making the process difficult for some stakeholders to follow.

Self-Assessment Conclusions—The staff concludes that the SDP has been effective in contributing to the ROP meeting its goals and intended outcomes. The SDP continues to serve as an essential component of the ROP, although continued improvements are needed. Although timeliness in reaching final significance determinations remains a challenge, the revised and new SDPs, with the associated training, the standardized risk-informed inspection notebooks, the Phase 2 pre-solved tables, the enhanced SPAR models, and other SDP process changes, including use of best available information, are all intended to achieve efficiencies and improve the process.